Amendments to the Specification

Please delete the heading on page 1, line 1, "~~DESCRIPTION~~".

Please replace the paragraph beginning at page 1, line 6 by the following paragraph.

The present application claims ~~the~~ priority under the Paris Convention based on Japan Patent Application Serial No. 2003-190280 (filing date : July 2, 2003, Title : Composite PTC Device), and is the national stage of International Application No. PCT/JP2004/009669, filed July 1, 2004. The disclosures of each of these are ~~the disclosure of this patent application is~~ incorporated herein by reference thereto in their entirety ~~and constructs a portion of the present specification~~.

Please replace the two paragraphs beginning at page 1, line 15 by the following paragraphs.

The present invention relates to a composite PTC device in which a plurality of PTC devices, for example two PTC devices, are combined, and also to such a PTC device as a protection device for an automobile ~~automotive~~.

It is noted that as is known in the field of electrical/electronic circuit technology, the "PTC device" denotes a thermistor having a positive temperature coefficient. The PTC device means a device that has a characteristic wherein its electrical resistance (or impedance) is low at a relatively low temperature (for example normal temperature), but increases sharply when the temperature exceeds a certain level (hereinafter, called ~~as~~ a trip temperature). In the present specification, the former state of the PTC device will be referred to as a low state, and the latter state a high state.

Please replace the paragraph beginning at page 2, line 15 by the following paragraph.

In the same way, similar safety protection devices should be installed from the standpoint of safety in an automobile using both a motor and an engine as power sources. Further, a wiring system for transmitting large power for driving the motor, which is to be the driving source, is also installed in the automobile using both the motor and the engine as the power sources. In such a wiring system which transmits such a large power, leakage ~~leak~~ currents are generated from time to time, which sometimes get into other wiring systems in their proximities.

Please amend the heading on page 3, line 1, as follows:

Summary ~~Disclosure~~ of the Invention

Please replace the three paragraphs beginning at page 3, line 2 by the following paragraphs.

Currently in such an automobile using both the motor and the engine as power sources, however, because the leakage ~~leak~~ currents are generated from time to time from the large power transmission wiring system for driving the motor, which is to be the driving source, and there is a risk of the leak currents being fed into other wiring systems in their proximities, devices similar to the safety protection devices in the signal circuits in the automobile having the normal engine as the power source cannot be used, so that in reality the safety protection devices are not installed in signal circuits. Therefore, the provision of a new PTC device that can function reliably as a PTC device is desired also on wiring in which a large power (or current) flows.

This invention provides a composite PTC device having a plurality of PTC devices each having a laminar PTC element comprising a polymeric PTC material and a pair of electrodes mutually separated and deployed on one side of the PTC element. In this device, the electrodes comprising one electrode from each pair of electrodes on the PTC devices are integrally connected electrically and are also connected to one terminal, while the electrodes comprising the other electrode from each pair of electrodes on the PTC devices are integrally connected electrically and are also connected to another ~~other~~ terminal. As a result, current flows through each laminar PTC element when entering the composite PTC device from the outside via said one terminal and exiting therefrom via said other terminal.

In a particularly preferred embodiment, the composite PTC device according to the present invention has two PTC devices (10, 10'), each having a laminar PTC element comprising a polymeric PTC material and a pair of electrodes mutually separated and deployed on one side of the PTC element, wherein the pair of electrodes (14, 16) on one of the PTC devices ~~device~~ (10) are face to face with ~~faced to~~ the pair of electrodes (14', 16') on the other PTC device ~~devices~~ (10'), and the terminals are connected to such facing electrodes respectively (i.e. the terminal 20 is connected to the electrodes 14 and 14', and the terminal 21 is connected to the electrodes 16 and 16'). Preferably, it is characterized that the terminals are deployed between these facing electrodes respectively (i.e. the terminal 20 is deployed

between the electrodes 14 and 14', and the terminal 21 is deployed between the electrodes 16 and 16') and the facing electrodes and the terminals between them are connected electrically.

Please replace the seven paragraphs beginning at page 5, line 2 by the following paragraphs.

By integrally and electrically connecting the electrodes comprising one electrode from each pair of electrodes on the plurality of PTC devices while also connecting them to one terminal (or lead), and similarly integrally and electrically connecting the electrodes comprising the other electrode from each pair of electrodes on the PTC elements while also connecting them to another terminal (or lead), a plurality of current paths passing through the PTC elements may be ensured in parallel, as a result of which a large power (or current) may be reliably divided into each current path even in a circuit which transmits a large power (or current), so that the composite PTC device as a whole may be used in a circuit which transmits a larger power (or current) than heretofore. For example, the composite PTC device according to the present invention may be used as an automotive protection device that can withstand use under 240 VDC ~~DC 240V~~ or higher (for example 600V). Thus, the present invention also provides a protection device for an automobile ~~automotive~~ comprising the above mentioned composite PTC device.

The PTC device which forms the composite PTC device according to the present invention is well known, and generally comprises a polymeric PTC element (an element formed of a polymer, for example a polyethylene, with a conductive filler such as carbon black dispersed therein), preferably a laminar or sheet-form of such element, and a pair of electrodes, preferably electrode foils, deployed on one side of the polymeric PTC element with a distance between them. The PTC element preferably has a cavity section in order to at least partially absorb the volume increase caused by thermal expansion during the trip and relax the generated stress. This cavity section preferably exists in at least one place selected from the regions of the polymeric PTC element on which regions the electrodes are deployed on their surfaces and their adjacent regions. (In ~~(in~~ the present specification, the former regions and the latter regions are together referred to as a peripheral region of the electrode.)~~.~~

It is preferred that the cavity section preferably extends in the thickness direction of the polymeric PTC element, and it is particularly preferred that the cavity section penetrates the polymeric PTC element through in the thickness direction. In particular, one or more cavity sections extend, preferably extend ~~with~~ for example penetrating the peripheral region of the electrode (in particular, the region of the polymeric PTC element on which region the electrode is deployed) through ~~in~~ the thickness direction. In the case of such penetration

~~penetrating~~ through, the end surface of the cavity section is positioned within the peripheral region of the electrode.

The present invention also provides a method of manufacturing a composite PTC device having a plurality of PTC devices each having a laminar PTC element comprising a polymeric PTC material and a pair of electrodes mutually separated and deployed on one side of the PTC element, and is characterized by integrally and electrically connecting the electrodes comprising one electrode from each pair of electrodes on the PTC devices and also connecting them to one terminal, while integrally and electrically connecting the electrodes comprising the other electrode from each pair of electrodes on the PTC devices ~~being~~ and also connecting them to other terminal, so that current flows through each laminar PTC element when entering the composite PTC device from the outside via one terminal and exiting therefrom via the other terminal.

In a particularly preferred embodiment, the method of manufacturing the composite PTC device according to the present invention is characterized in that

two PTC devices (10, 10') are prepared, each having the laminar PTC element comprising the polymeric PTC material and the pair of the electrodes mutually separated and deployed on one side of the PTC element,

said one terminal is positioned between one electrode (14) of the pair of electrodes on one of the PTC devices and one electrode (14' ~~16~~) of the pair of the electrodes on the other of the PTC devices, and said other terminal is positioned between the other electrode (16 ~~14'~~) of the pair of electrodes on the one ~~other~~ of the PTC devices and the other (16') electrode of the pair of the electrodes on the other of the PTC devices, and

the facing electrodes and the terminals between them are connected electrically.

The composite PTC device according to the present invention withstands use under a high voltage energized environment of 240VDC ~~DC 240V~~ and higher, for example 600VDC ~~DC 600V~~. Also, the device can easily ensure safety since the electrodes on each PTC device are positioned on one side of the PTC element so that there is little risk of formation of a short circuit even when a high current and a high voltage are applied causing the device to fail.

Further, when the cavity section is provided in the polymeric PTC element, the number of trips before the device reaches failure (i.e. the number of shifts ~~shifting~~ from the

low state to the high state) is increased even when it undergoes thermal expansion through the repeated trips. In other words, the device better withstands a high voltage and the resistance of the device may be maintained at a low resistance. Also, if one of the PTC devices constructing the composite PTC devices reaches failure for some reason, the other PTC device(s) can maintain the operating state since the parallel circuit is formed within the composite PTC device, so that the composite PTC devices according to the present invention can provide the protection devices for an automotive having a high reliability.

Please amend the heading on page 9, line 24, as follows:

Detailed Description of ~~Embodiments for Carrying out~~ the Invention

Please replace the paragraph beginning at page 12, line 5 by the following paragraph.

The material of the terminal may be any material as long as it is electrically conductive, such as copper, iron, nickel, bronze, and the like. Further, there are cases in which it is preferred that such a terminal is provided with surface treatment (for example plating) using tin or nickel.

Please replace the heading on page 14, line 1, as follows:

What is claimed is: ~~CLAIMS~~

Please replace the Abstract beginning on page 16, line 3 by the following amended Abstract:

A PTC device is provided which is capable of surely functioning as the PTC device even in a wiring through which a large current flows. ~~¶~~—A combined PTC device (10, 10') is composed of two PTC devices each containing ~~respectively comprising~~ a lamellar PTC element (12, 12') which is composed of a polymeric PTC material and a pair of electrodes (14,16; and 14',16') which are arranged apart from each other on one side of the PTC element. The electrodes (14, 16) of one PTC device are respectively opposite to the electrodes (14', 16') of the other PTC device, and terminals (20, 21) are arranged between the respective opposite electrodes. The respective opposite electrodes and the terminal between them are electrically connected with each other.